

1                   **What Is Claimed Is:**

2                   1. A method of supporting network address translation (NAT) in a gateway device, said  
3                   method comprising:

4                   maintaining a plurality of NAT tables in said gateway device, wherein each of said plurality of  
5                   NAT tables maintains a mapping information of original addresses to corresponding new addresses;

6                   receiving a packet containing an original address;

7                   translating said address into a new address by examining one of said plurality of NAT tables;

8                   substituting said new address for said original address in said packet to generate a new packet;

9                   and

0                   sending said new packet.

1                   2. The method of claim 1, wherein said gateway device comprises a service selection gateway  
2                   (SSG) connecting a plurality of remote systems to a plurality of service domains, wherein one of said  
3                   original address and said new address comprises a local address of a remote system and the other  
4                   address comprises an external address for said remote system in a service domain, said maintaining  
5                   further comprises:

6                   storing mapping information in said plurality of NAT tables partitioned according to service  
7                   domains such that mapping information related to external addresses of the same service domain is  
8                   stored in the same NAT table.

1                   3. The method of claim 2, wherein each of said plurality of NAT tables stores NAT information  
2                   corresponding to one of said plurality of service domains only.

1                   4. The method of claim 2, wherein at least one of said plurality of NAT tables stores all  
2                   mapping information related to at least two of said plurality of service domains, wherein external  
3                   addresses provided for mapping by said at least two of said plurality of service domains do not overlap.

1           5. The method of claim 2, wherein said original address comprises said local address, and said  
2 translating comprises mapping said local address to said external address, wherein said external address  
3 is assigned to said remote system by said service domain accessed by said remote system.

1           6. The method of claim 5, further comprising:  
2           determining a service domain to which said packet relates to, wherein said service domain is  
3 comprised in said plurality of service domains; and  
4           sending said packet to an upstream NAT block which performs said substitution.

1           7. The method of claim 6, wherein said remote system communicates with said SSG on a  
2 point-to-point protocol (PPP) session, said method further comprising:  
3           assigning said local address to said remote system when said PPP session is set up;  
4           storing in said SSG data representing a set of services available for packets received from said  
5 remote system, wherein said determining comprises examining a destination address in said packet to  
6 identify said service domain to which said packet relates to.

1           8. The method of claim 7, wherein a separate upstream NAT block associated with each of  
2 said plurality of NAT tables.

1           9. The method of claim 8, further comprising maintaining a separate forwarding table  
2 associated with the service domains sharing the same NAT table.

1           10. The method of claim 2, wherein said packet is received from said service domain and  
2 destined to said first remote system, and wherein said original address comprises said external address  
3 of said remote system.

1           11. The method of claim 10, further comprising:

- 2 maintaining a global forwarding table; and
- 3 determining a route to send said packet by examining said global forwarding table, wherein said
- 4 determining is performed after said substituting.

1                   12. The method of claim 2, wherein said packet is received according to Internet Protocol  
2                   (IP).

1           13. A gateway device supporting network address translation (NAT), said gateway device  
2           comprising:

3 means for storing a plurality of NAT tables in said gateway device, wherein each of said  
4 plurality of NAT tables maintains a mapping information of original addresses to corresponding new  
5 addresses

means for receiving a packet containing an original address;

means for translating said address into a new address using one of said plurality of NAT tables;

means for substituting said new address for said original address in said packet to generate a packet; and

14. The gateway device of claim 13, wherein said gateway device comprises a service  
selection gateway (SSG) connecting a plurality of remote systems to a plurality of service domains,  
wherein one of said original address and said new address comprises a local address of a remote  
system and the other address comprises an external address for said remote system in a service domain,  
said means for storing maps information in said plurality of NAT tables partitioned according to service  
domains such that mapping information related to external addresses of the same service domain is  
stored in the same NAT table.

1 15. The gateway device of claim 14, wherein said means for storing stores NAT information

2 corresponding to one of said plurality of service domains only in each of said plurality of NAT tables.

1           16. The gateway device of claim 14, wherein at least one of said plurality of NAT tables stores  
2 NAT information related to at least two of said plurality of service domains, wherein said at least two  
3 of said plurality of service domains have non-overlapping address space accessible by said remote  
4 systems.

1           17. The gateway device of claim 14, wherein said original address comprises said local  
2 address, and said translating comprises mapping said local address to said external address, wherein  
3 said external address is assigned to said remote system by said service domain accessed by said remote  
4 system.

1           18. The gateway device of claim 17, wherein said packet is received from said remote system  
2 and said original address comprises said local address, said gateway device further comprising:  
3           means for determining a service domain to which said packet relates to, wherein said service  
4 domain is comprised in said plurality of service domains; and

5           means for sending said packet to an upstream NAT block which performs said substitution.

1           19. The gateway device of claim 18, wherein said remote system communicates with said SSG  
2 on a point-to-point protocol (PPP) session, said gateway device further comprising:  
3           means for assigning said local address to said remote system when said PPP session is set up;

4           and

5           means for storing data representing a set of services available for packets received from said  
6 remote system, wherein said means for determining examines a destination address in said packet to  
7 identify said service domain to which said packet relates to.

1           20. A computer readable medium carrying one or more sequences of instructions for causing

2 a gateway device to support network address translation (NAT), wherein execution of said one or  
3 more sequences of instructions by one or more processors contained in said gateway device causes  
4 said one or more processors to perform the actions of:

5 maintaining a plurality of NAT tables in said gateway device, wherein each of said plurality of  
6 NAT tables maintains a mapping information of original addresses to corresponding new addresses;  
7 receiving a packet containing an original address;  
8 translating said address into a new address using one of said plurality of NAT tables;  
9 substituting said new address for said original address in said packet to generate a new packet;

10 and

11 sending said new packet.

21. The computer readable medium of claim 20, wherein said gateway device comprises a service selection gateway (SSG) connecting a plurality of remote systems to a plurality of service domains, wherein one of said original address and said new address comprises a local address of a remote system and the other address comprises an external address for said remote system in a service domain, said maintaining further comprises:

6 storing mapping information in said plurality of NAT tables partitioned according to service  
7 domains such that mapping information related to external addresses of the same service domain is  
8 stored in the same NAT table.

1 22 The computer readable medium of claim 21, wherein each of said plurality of NAT tables  
2 stores a NAT information corresponding to one of said plurality of service domains.

1 23. The computer readable medium of claim 21, wherein at least one of said plurality of NAT  
2 tables stores NAT information related to at least two of said plurality of service domains, wherein said  
3 at least two of said plurality of service domains have non-overlapping address space accessible by said  
4 remote systems.

1           24. The computer readable medium of claim 21, wherein said original address comprises said  
2 local address, and said translating comprises mapping said local address to said external address,  
3 wherein said external address is assigned to said remote system by said service domain accessed by  
4 said remote system.

1           25. The computer readable medium of claim 24, further comprising:  
2           determining a service domain to which said packet relates to, wherein said service domain is  
3 comprised in said plurality of service domains; and  
4           sending said packet to an upstream NAT block which performs said substitution.

1           26. The computer readable medium of claim 25, wherein said remote system communicates  
2 with said SSG on a point-to-point protocol (PPP) session, further comprising:  
3           assigning said local address to said remote system when said PPP session is set up;  
4           storing in said SSG data representing a set of services available for packets received from said  
remote system, wherein said determining comprises examining a destination address in said packet to  
identify said service domain to which said packet relates to.

1           27. The computer readable medium of claim 26, wherein a separate upstream NAT block is  
2 associated with each of said plurality of NAT tables.

1           28. The computer readable medium of claim 27, further comprising maintaining a separate  
2 forwarding table associated with the service domains sharing the same NAT table.

1           29. The computer readable medium of claim 24, wherein said packet is received from said  
2 service domain and destined to said first remote system, and wherein said original address comprises  
3 said external address of said remote system.

1           30. The computer readable medium of claim 29, further comprising:  
2           maintaining a global forwarding table; and  
3           determining a route to send said packet by examining said global forwarding table, wherein said  
4           determining is performed after said substitution.

1           31. The computer readable medium of claim 24, wherein said packet is received according  
2           to Internet Protocol (IP).

1           32. A gateway device supporting network address translation (NAT), said gateway device  
2           comprising:

3           a memory storing a plurality of NAT tables representing information related to network address  
4           translation, wherein each of said plurality of NAT tables maintains a mapping information of original  
5           addresses to corresponding new addresses;

6           an inbound interface receiving a packet containing an original address;

7           a NAT block translating said address into a new address using one of said plurality of NAT  
8           tables and substituting said new address for said original address in said packet to generate a new  
9           packet; and

10          an outbound interface sending said new packet.

1           33. The gateway device of claim 32, wherein said gateway device comprises a service  
2           selection gateway (SSG) connecting a plurality of remote systems to a plurality of service domains,  
3           wherein one of said original address and said new address comprises a local address of a remote  
4           system and the other address comprises an external address for said remote system in a service domain,  
5           said memory storing mapping information in said plurality of NAT tables partitioned according to  
6           service domains such that mapping information related to external addresses of the same service domain  
7           is stored in the same NAT table.

1           34. The gateway device of claim 33, wherein each of said plurality of NAT tables stores a  
2           NAT information corresponding to one of said plurality of service domains.

1           35. The gateway device of claim 33, wherein at least one of said plurality of NAT tables stores  
2           NAT information related to at least two of said plurality of service domains, wherein said at least two  
3           of said plurality of service domains have non-overlapping address space accessible by said remote  
4           systems.

1           36. The gateway device of claim 33, wherein said original address comprises said local  
2           address, and said translating comprises mapping said local address to said external address, wherein  
3           said external address is assigned to said remote system by said service domain accessed by said remote  
4           system.

1           37. The gateway device of claim 36, wherein said packet is received from said first remote  
2           system and said original address comprises a source address of said first remote system.

1           38. The gateway device of claim 37, further comprising:  
2           a service selection table storing data indicating a mapping of each packet to a corresponding  
3           one of said plurality of service domain; and  
4           a service selector determining a service domain to which said packet relates to by examining  
5           said service selection table, wherein said service domain is comprised in said plurality of service  
6           domains and sending said packet to said NAT block.

1           39. The gateway device of claim 38, wherein a separate upstream NAT block associated with  
2           each of said plurality of NAT tables.

1           40. The gateway device of claim 39, further comprising a separate forwarding table associated  
2       with the service domains sharing the same NAT table.

1           41. The gateway device of claim 36, wherein said packet is received from said service domain  
2       and destined to said first remote system, and wherein said original address comprises said external  
3       address of said remote system.

1           42. The gateway device of claim 41, further comprising:  
2       a global forwarding table; and  
3       a forwarding block determining a route to send said packet by examining said global forwarding  
table, wherein said forwarding block determines said route after said substituting.

4           43. The gateway device of claim 36, wherein said packet is received according to Internet  
5       Protocol (IP).

6           44. The gateway device of claim 32, wherein said memory is implemented as a plurality of  
7       units.